METHOD, APPARATUS AND COMPUTER PROGRAM PRODUCT FOR IMAGE STABILIZATION

TECHNICAL FIELD

[0001] Various implementations relate generally to method, apparatus, and computer program product for image stabilization.

BACKGROUND

[0002] An increasing number of devices are equipped with media capture tools, such as a camera, thereby facilitating an ease of capture of content, such as images. In some exemplary scenarios, an image may be captured in less than ideal conditions. For example, an image of an object may be captured while the object is in motion or an image capture device may not be steady while capturing the image of an object or both. In such scenarios, the captured image may include blurring of content, which may produce a distorting effect on the details included in the image.

SUMMARY OF SOME EMBODIMENTS

[0003] Various aspects of examples of examples embodiments are set out in the claims.

[0004] In a first aspect, there is provided a method comprising: configuring a pre-determined movement of at least one of a lens element and a sensor element; and performing the pre-determined movement of the at least one of the lens element and the sensor element during capturing of an image.

[0005] In a second aspect, there is provided an apparatus comprising at least one processor; and at least one memory comprising computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus to at least perform: configuring a pre-determined movement of at least one of a lens element and a sensor element; and performing the pre-determined movement of the at least one of the lens element and the sensor element during capturing of an image.

[0006] In a third aspect, there is provided an apparatus comprising: a lens element; a sensor element; at least one processor; and at least one memory comprising computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus to at least perform: configuring a pre-determined movement of at least one of the lens element and the sensor element; and performing the pre-determined movement of the at least one of the lens element and the sensor element during capturing of an image.

[0007] In a fourth aspect, there is provided a computer program product comprising at least one computer-readable storage medium, the computer-readable storage medium comprising a set of instructions, which, when executed by one or more processors, cause an apparatus at least to perform: configuring a pre-determined movement of at least one of a lens element and a sensor element; and performing the pre-determined movement of the at least one of the lens element and the sensor element during capturing of an image.

[0008] In a fifth aspect, there is provided an apparatus comprising: means for configuring a pre-determined movement of at least one of a lens element and a sensor element; and means for performing the pre-determined movement of the at least one of the lens element and the sensor element during capturing of an image.

[0009] In a sixth aspect, there is provided a computer program instructions which when executed by an apparatus, cause the apparatus to: configure a pre-determined movement of at least one of a lens element and a sensor element; and perform the pre-determined movement of the at least one of the lens element and the sensor element during capturing of an image.

BRIEF DESCRIPTION OF THE FIGURES

[0010] Various embodiments are illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings in which:

[0011] FIG. **1** illustrates a device in accordance with an example embodiment;

[0012] FIG. **2**A illustrates an apparatus for image stabilization in accordance with an example embodiment;

[0013] FIG. **2**B illustrates an apparatus for image stabilization in accordance with another example embodiment;

[0014] FIG. **3** illustrates a simplified configuration of a lens element and a sensor element for performing a pre-determined movement of the lens element and/or the sensor element in accordance with an example embodiment;

[0015] FIGS. **4**A and **4**B illustrate magnitude and phase frequency response plots corresponding to a pre-coded motion blur function, respectively, in accordance with an example embodiment;

[0016] FIGS. **5**A and **5**B illustrate de-blurred image without and with the pre-determined movement of the lens element and/or the sensor element, respectively, in accordance with an example embodiment;

[0017] FIGS. **6**A and **6**B illustrate images captured without and with the pre-determined movement of the lens element and/or the sensor element, respectively, in accordance with an example embodiment;

[0018] FIG. **7** is a flowchart depicting an example method for image stabilization in accordance with an example embodiment; and

[0019] FIG. **8** is a flowchart depicting an example method for image stabilization in accordance with another example embodiment.

DETAILED DESCRIPTION

[0020] Example embodiments and their potential effects are understood by referring to FIGS. **1** through **8** of the drawings.

[0021] FIG. **1** illustrates a device **100** in accordance with an example embodiment. It should be understood, however, that the device **100** as illustrated and hereinafter described is merely illustrative of one type of device that may benefit from various embodiments, therefore, should not be taken to limit the scope of the embodiments. As such, it should be appreciated that at least some of the components described below in connection with the device **100** may be optional and thus in an example embodiment may include more, less or different components than those described in connection with the example embodiment of FIG. **1**. The device **100** could be any of a number of types of mobile electronic devices, for example, portable digital assistants (PDAs), pagers, mobile televisions, gaming devices, cellular phones, all types of computers (for example, laptops, mobile computers or desktops), cameras, audio/video players, radios, global positioning sys-